

# PATENT SPECIFICATION

403,238

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## COMPLETE SPECIFICATION.



### Improvements in or relating to Portable Containers for Compressed and Liquefied Gases.

I, ERNST FERNHOLZ, a German Citizen, of Hohenzollernkorso 5, Berlin-Tempelhof, Germany, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

Portable high pressure containers for compressed and liquefied gases are required for the most diverse purposes, for example, in plants for the household production of carbonated beverages, oxygen breathing and life saving apparatus, fire extinguishing apparatus, for the transport of living fish and so forth.

In all these cases, in which the contents of the containers are to be removed under a reduced pressure of use, the container together with the necessary filling, closing and pressure regulating devices, must be as light as possible, capable of easy manipulation and certain in operation.

Hitherto in high pressure containers a number of separate valves, charging valve, adjustable pressure reducing valve, safety valve and so forth have usually been employed, it being difficult to combine the functions of the several valves on account of the high pressures to be dealt with. Valve constructions which may be suitable for relatively low pressures are not generally as satisfactory for high pressure purposes.

The present invention relates to a portable high pressure container for compressed and liquefied gases which is capable of being constructed easily and extremely cheaply and is also entirely certain in operation, whilst it requires very little space. The high pressure container according to the invention, therefore, satisfies all requirements and is particularly suitable for the various purposes set out above by way of example.

The portable high pressure container according to the present invention has a combined sealing, charging, and pressure-reducing discharge valve consisting of a non-return valve controlled by a spring-loaded diaphragm, which valve directly obturates a chamber connected with a

charging and discharging aperture, one wall of the chamber being formed by the diaphragm, whilst behind the diaphragm is arranged a supporting surface adapted to prevent the diaphragm from being bent out on that side. This construction is not to be confused with known valve constructions employing diaphragms which are capable of appreciable bending in both directions.

Preferably the non-return valve member opens directly into the container and is provided with a pliable sealing washer, the pressure of valve member upon said washer being limited through the intermediary of the said diaphragm and supporting surface.

A form of construction of the invention is illustrated by way of example in the accompanying drawing which shows a vertical section of the portable high pressure container and its valve which serves simultaneously for filling, discharging and closing.

Into the neck of the steel cylinder 1 is screwed, with a conical packing, the casing 2 which carries the inlet and outlet 13 and has a pipe-like extension 3 projecting inside the cylinder for a distance amounting to a few centimetres. The extension 3 serves to prevent the entraining of rust particles or other impurities. A bush 4 is tightly screwed into the casing 2, and in this a check valve 5 having a packing ring 6 is guided by its shaft 5a which is of rectangular, cruciform, or other suitable cross-section and projects slightly above the bush. The cover 7 is screwed in so as to be high-pressure-proof, its downward movement being limited by a flange.

The casing 2 is provided with a chamber 8 which can be connected with the inside of the cylinder 1 by the check valve 5 and which opens into the inlet and outlet 13. One of the walls of the chamber 8 is formed by a thin diaphragm 9 which partly rests on a packing ring 15 and partly is in direct contact with the inside of the cover 7. The screwing depth of the cover 7 is chosen so that the ring 15 is compressed sufficiently to pack tightly and the diaphragm 9 will simultaneously

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Price 2s 6d.

be adjacent approximately to the projecting shank 5a of the check valve 5. In the longitudinal bore of the cover 7 a helical spring 12 is guided which carries on the inside the spring extremity shoe 10 and on the outside the pressure pin 14, the shoe 10 in the cover 7 being arranged so that one of its end faces is flush with the inner cover surface when its other end face firmly engages a shoulder 16 in the cover 7. The pin 14 has a collar 17 and extends for a distance inside the spring 12 and, outwardly, beyond the cover 7 up to the bottom of the thrust screw 11.

The valve functions as follows:

During the filling of the steel cylinder the high pressure gas flows through the connection 13 into the chamber 8 and thence through the check valve 5, which offers no resistance in one direction of flow, into the cylinder 1. When the filling pressure ceases the cylinder pressure will automatically close the check valve 5 tightly and firmly. The thin diaphragm 9 cannot be damaged by high pressure during the filling operation, since it closely hugs the cover 7 and the spring shoe 10 and is thus not exposed to stresses. The packing of the casing 2 by the ring 15 cannot be interfered with by the high pressure which will press the ring only more tightly into its closed bearing. To preserve the packing ring 6 as long as possible the closed check valve 5 is not subjected to the full cylinder pressure. If, for instance, soft rubber is used for the valve size shown a load of a few kilograms will suffice, the considerably higher residual load at full cylinder pressure being rendered harmless by supporting the check valve 5. In the embodiment illustrated the angular valve rod 5a will be supported, for example, by the diaphragm 9, shoe 10 and shoulder 16 already at a load of a few kilograms and thus transmit the excess pressure to the firm cover 7.

If gas is to be taken out of the cylinder under constant reduced pressure, the thrust screw 11 is tightened to compress the spring 12 which with its shoe 10 presses against the diaphragm 9 which lifts the check valve 5 from its seat so that gas can flow out. When the pressure in the chamber 8 has reached a certain degree, the diaphragm 9 is, however, pressed back whereby the check valve 5 will be closed and the discharge of gas be stopped. The amount of this pressure depends on the tension of the spring 12, that is, on the position of the thrust screw 11.

If gas is to be discharged under full cylinder pressure while, for example, being transferred from a larger container to smaller vessels, the thrust screw 11 is tightened until the pin 14 presses directly against the spring shoe 10 to eliminate the action of the spring 12. As the diaphragm 9 cannot be pressed back any more under these circumstances, the check valve 5 will remain open even at full cylinder pressure in the casing 2 and permit the passage of the high pressure gas.

The closing valve according to the invention does not require a safety valve, since it is itself equipped for high pressure. The conduits are best protected by attached hose members which will slide off after a certain maximum pressure has been exceeded.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. A portable high pressure container for compressed and liquified gases with a combined sealing, charging, and pressure-reducing discharge valve consisting of a non-return valve controlled by a spring-loaded diaphragm, which valve directly obturates a chamber connected with a charging and discharging aperture, one wall of the chamber being formed by the diaphragm, whilst behind the diaphragm is arranged a supporting surface adapted to prevent the diaphragm from being bent out on that side.

2. A portable high pressure container according to claim 1, wherein the non-return valve member is provided with a pliable sealing washer, the pressure of the valve member upon said washer being limited through the intermediary of the said diaphragm and supporting surface.

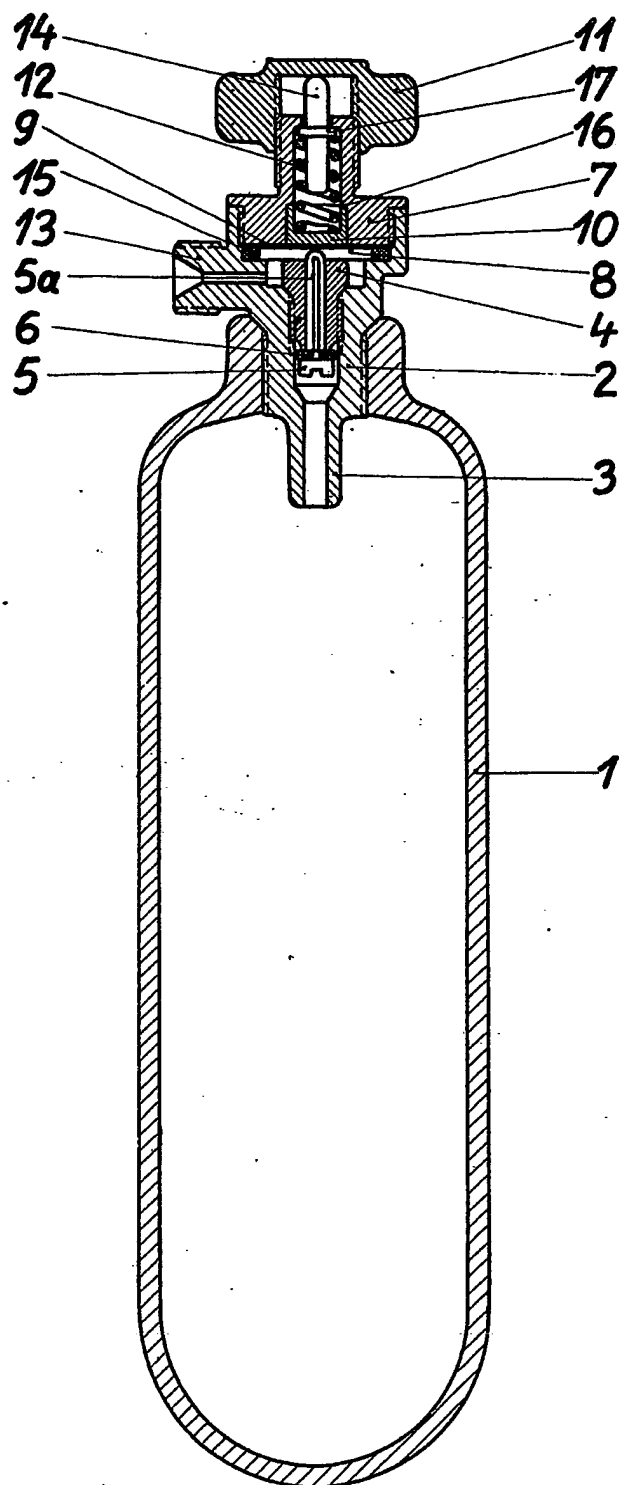
3. Portable high pressure containers for compressed and liquified gases, constructed, arranged and adapted for use as a whole, substantially as described with reference to the accompanying drawing.

Dated this 7th day of July, 1933.

For the Applicant,  
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Reference has been directed, in pursuance of Section 7, Sub-section 4, of the Patents and Designs Acts, 1907 to 1932, to Specification No. 22,965/1903.

[This Drawing is a reproduction of the Original on a reduced scale.]



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